Proposed Long-Term Monitoring Plan for Assessing Ecological Changes in the Gulf of Mexico Due to the Deepwater Horizon Spill

Prepared by EPA Region 6 Water Quality Protection Division

EXECUTIVE SUMMARY

EPA water monitoring activities for the Deepwater Horizon Oil Spill in the Gulf of Mexico to date have primarily been designed to determine the baseline/pre-spill conditions and the concentrations of oil-related contaminants. Sampling within the spill area includes a number of oil-related constituents such as metals, oil and grease, TPH, TOC, VOC and SVOC, dispersant-related constituents and alkylated PAHs.

EPA proposes to implement a long-term monitoring design in estuaries, nearshore areas, along beaches and in coastal wetlands located in the spill area in the spring of 2011. Overall, efforts would focus on oil-related parameters and biological data (benthic organisms, fish, marsh grasses, etc.) with limited analyses for dispersants. In order to fully assess impacts due to the spill and the rate of ecological recovery, long-term monitoring is proposed to be conducted on an annual basis for 3-5 years, with information synthesized and reported annually.

This monitoring effort will provide the data necessary to assess regional conditions and inform decisions on appropriate restoration efforts. The proposed monitoring strategy will determine whether biological communities are showing changes over time that can be attributed to the oil spill, whether contaminants are accumulating in sediments, fish tissue, etc. and whether restoration activities are needed.

While preliminary findings indicate that the chemical/toxicological effects of the oil spill may be limited, sampling performed in the wake of the disaster is insufficient to assess long-term or latent ecological effects that may affect coastal communities and economies for years to come. No other sampling is under way or planned that will provide a sound, scientific basis for answering questions of ecological conditions and rate of recovery in nearshore waters suggested by this strategy.

Implementation of the strategy will be facilitated by the knowledgebase developed by contractors, EPA personnel, and laboratories during the emergency response sampling over the past few months. Also, both State agencies and many contractors have conducted NCCA sampling during previous cycles and have the capacity and experience to conduct the efforts effectively and efficiently. Familiarity with protocols, sites, and the general environment will allow for swift implementation of sampling and analytical plans.

Because the proposed monitoring activities would be conducted in addition to existing EPA Programs, funding must be identified to implement the proposed strategy.

INTRODUCTION

Soon after the explosion and sinking of the Deepwater Horizon oil platform, EPA initiated emergency operations, including monitoring of air pollutants from both the exposed crude oil and the controlled burning of recovered oil, and sampling of surface water and sediment. Efforts were made to deploy monitoring personnel to obtain baseline, or pre-impact samples in areas not yet affected by the spill.

During the emergency response, EPA compared results for oil-related metals and organic compounds against water quality criteria and screening level benchmarks. Sampling activities in the near shore area (within 3 miles from shore) included analysis of water and sediment samples for a number of metals, dispersant compounds, oil and grease, TPHs, TOC, VOCs, and SVOCs (inclusive of a number of parent and alkylated PAH compounds).

The emergency response sampling design for water and sediment was based on historical sampling locations, targeting areas that were or were expected to be oiled, and on observations and "samples of opportunity" collected at the discretion field personnel. The design was largely successful at addressing the immediate objectives to evaluate and inform the public of the extent of the spill as it progresses away from the spill site and makes landfall on coastlines. The long-term monitoring design, however, will answer important questions about the ecological condition of the northern Gulf of Mexico and potential changes due to the BP oil spill.

Data collected since the April 29th oil spill points to no clear toxicological or ecological impacts - in evident contradiction of field observations and the potential for long-term impacts. This highlights the need to reconsider the present sampling objectives.

The following questions should be considered as we develop the long term monitoring data quality objectives (DQO's):

- How prevalent are oil-related contaminants in the Gulf of Mexico since the oil release began?
- Did the oil spill cause ecological degradation?
- To what extent have aquatic organisms/ecological communities been impacted by the spill?
- Is the Gulf of Mexico recovering since the oil release was stopped, and if so, what is the rate of recovery?
- Do the changes in ecological condition require restoration actions, or will conditions return to pre-impact levels "naturally?"

STRATEGY

We recognize the desire by EPA leadership for continued data collection in impacted areas and the dissemination of data to the public while new oil continues to flow into the Gulf and wash ashore. After the source of the oil is successfully contained and new oil entering the ecosystem slows, we recommend a phased shift to reduced sampling and, ultimately, a multi-year monitoring approach combining both probabilistic and targeted designs.

For the 2010 NCCA cycle, approximately 240 randomly selected nearshore (estuarine) sites are scheduled for sampling in the Gulf of Mexico (FL, AL, MS, LA, TX). Samples will be collected for sediment chemistry (including PAHs), sediment toxicity, basic water quality and nutrients, whole fish tissue analysis for contaminants, and benthic macroinvertebrate composition and abundance. Although the NCCA sample design does not address individual events such as the current oil spill, the design of the 2010 study is proposed to be enhanced by including oil-related and dispersant constituents, as well as additional sampling sites in more heavily-impacted areas.

The long-term strategy will build on the framework and historical data provided by the multi-year sampling efforts of the NCCA and the National Wetlands Condition Assessment (NWCA). A long-term design utilizing a combined probabilistic and targeted design will provide a means to utilize historical data to make direct comparisons with pre-impact conditions and with the vast

dataset collected during the spill event. These comparisons will allow the Agency to effectively answer questions about the health of coastal estuary and marshland ecosystems and directly assess changes in the ecological conditions of the northern Gulf of Mexico due to the BP oil spill.

JUSTIFICATION

Sampling to date has resulted in a small number of exceedances of benchmarks for oil related constituents in the water column and sediment, relative to the number of samples collected. However, limited toxicity data are available to fully assess the potential effects of oil related contaminants on aquatic life. While preliminary findings indicate that the chemical/toxicological effects of the oil spill may be limited, sampling performed in the wake of the disaster is insufficient to assess long-term or latent ecological effects that may affect coastal communities and economies for years to come.

A recent survey of State and Federal sampling activities in areas affected, or predicted to be affected, by the spill indicate only small-scale, targeted sampling projects designed to address questions of localized impact or specific questions of impact. No other sampling is under way or planned that will provide a sound, scientific basis for answering questions of ecological conditions and rate of recovery in nearshore waters suggested by this strategy.

IMPLEMENTATION

Capacity for monitoring in the spill area has been established through previous NCCA and NWCA projects and enhanced during the emergency response field activities. Contractors and EPA staff have developed familiarity with sites, protocols, and the environment of the affected area, creating skills and knowledge essential for successful continuation of data collection and analysis from the affected areas.

EPA is also well positioned to implement a long-term sampling design to assess the effects of the BP oil spill, including key features such as:

- An economical probabilistic sampling design
- Ability to determine regional and national ecological integrity, and recreational quality of the nation's coastal waters.
- Ability to track trends/changes to evaluate progress in improving water quality over time.
- Estimate the proportion of regional estuarine resources (e.g. Gulf of Mexico) in degraded condition within a ±15% margin of error and with 95% confidence.

Data Collection

Implementation of the long-term plan should be a joint effort, developed in coordination with OWOW, R6, and R4. Key components of the data collection activities include:

For chemical analysis, we propose to incorporate an expanded PAH list that includes select oil related parent PAHs and alkylated PAHs in all media and dispersants in all media. For toxicity testing, add Qwiklite as a toxicity screening tool for all media that would guide more costly and comprehensive testing. Site selection for sampling would be based on the probabilistic design but possibly some stratification based on areas of greater concern.

- Expand list of compounds to be analyzed in water and fish tissue.

- Include assessment of seagrass/marsh vegetative cover at a scale modeled after the NWCA
- The overall number of sites selected will be based on maintaining a probabilistic design as determined by the NCCA and NWCA methods. Though select sites may be revisited for more comprehensive testing if contaminants or observations of interest are detected (i.e. If toxicity is detected with Qwiklite, than that site will be selected for more comprehensive toxicity testing using a battery of tests)
- Stratify sample design to encompass smaller spatial scales such as the projected oil footprint, State estuarine waters within the footprint (LA, MS, AL, FL panhandle), or even specific bays/estuaries or groupings of bays/estuaries (Louisiana 4 digit coastal segments or groupings of segments) .
- Increase sampling frequency to annual basis (to assess recovery) over next 3-5 years
- Reduce number of analytes in the non-5-year NCCA rotations to include only oil related constituents (e.g. remove pesticides/PCBs, *Enterococcus*, PAR, silt/clay, nutrients). Appropriate decision criteria will be utilized when eliminating an analyte such as frequency of detects, magnitude of detects, comparisons to screening values, etc.

Overall, costs should be similar to the $5,000/site estimated for previous NCCA work. For laboratory analyses, the costs for additional oil-related analyses would be $111/sample for Alkyl PAHs in sediment and fish, $277/sample for PAHs & alkyl PAHs in water, for dispersants: cost estimate pending review of methods as outlined at http://www.epa.gov/bpspill/dispersant-methods.html , and for Qwiklite toxicity analyses, $50/sample (includes 5 reps and 1 control per site)

Data Analyses and Reporting

Benefits of utilizing a long-term monitoring design are the ability to perform direct comparisons with historical data and the ability to detect changes in ecological condition of the study area with statistical confidence. The proposed analysis utilizes key indicators of ecological health (below) and assigns a score of good, fair, or poor, which can be composited and averaged to create overall scores. This approach could be applied to assessment of the oil spill area, using assessments at smaller scales, i.e. state jurisdictions.

- water quality index,
- sediment quality index,
- benthic index,
- coastal habitat index, and
- fish tissue contaminants index

Reporting would be conducted annually, with several months lag-time between sample collection and final reporting.

Resources and Funding

Because the proposed monitoring activities would be conducted in addition to existing EPA Programs, additional funding is needed to implement the proposed strategy.